

Porifera of Friday Harbor and Vicinity

M. W. DE LAUBENFELS¹

THE PORIFERA of the northwest coast of North America were described rather thoroughly in three papers by L. M. Lambe (1892, 1893, 1894). Many sponges which he treated were from Vancouver Island, near the location herein discussed. Otherwise the Puget Sound Porifera have been little studied.

The present paper is based on a study made by the author during the summer of 1931. Intertidal species were studied living, in the field. Dredged specimens were examined practically immediately upon removal from the water. T. G. Thomson, director of the Oceanographic Laboratories at that time, and other members of the staff, rendered valuable cooperation for which gratitude is hereby expressed.

While other invertebrates were found in considerable variety, amazingly few species of sponges were found to occur in the San Juan Archipelago. The number of individual specimens was large, so that one may conclude that conditions were suitable for the survival and growth of sponges. Notwithstanding careful search of the shores and almost daily dredging for several weeks, the collection consists of representatives of 16 genera, 17 species in all, 2 of which, *Stylissa stipitata* and *Syringella amphispicula*, are new to science. Two species of the class Calcispongiae were found. No dredging was done deep enough to bring up sponges of the class Hyalospongiae. The 15 species of the class Demospongiae represent 14 genera.

CALCISPONGIAE

Leucosolenia nautilia de Laubenfels, 1930

The sponge thus identified was collected July 4, 1931, near the town of Lopez in Lopez Island. It was dredged from a depth of about 60 m.

It consists of a mass of tubes, each somewhat less than 1 mm. in diameter, occasionally anastomosing, but much more frequently branch-

ing. The mass of tubes arises from a basal rhizome or reticulation of tubes affixed to the substratum. The maximum distance from this which is reached by the ascending or descending tubes is barely 1 cm. The color in life was white; the consistency softly fragile. The occasional oscules are located at the distal extremities of the ascon tubes and are less than 1 mm. in diameter. The surface is optically smooth, and microscopically somewhat roughened by spicules which protrude, but not at right angles, they lie tangentially in the ectosome, their points directed toward the oscule. Around the oscule in each is found a coronal fringe of special oxeas about $6 \times 300\mu$. The obliquely placed dermal oxeas are somewhat larger, say about $8 \times 420\mu$. The principal spicules in among the flagellate cells of the ascon layer are triaxons with rays about $8 \times 140\mu$. There are a few hypogastral quadriradiates, of approximately the same size as the triradiates.

This is the second record of this species, the first being by de Laubenfels (1930: 25) from Monterey Bay, California. The Puget Sound specimen has somewhat smaller oxeas echinating the surface than do the California specimens, but otherwise it agrees very closely. The other species of *Leucosolenia* which is probably most closely to be compared here, and which therefore indicates the zoogeographical relationships of the form under discussion, is *Leucosolenia echinata* Kirk (1894: 177) from New Zealand. All its spicules are noticeably larger than those of *nautilia* and it is remarkable that in it the quadriradiates considerably exceed the triradiates in abundance. Furthermore, it is not recorded by Kirk that there were special coronal oxeas, although this may have been the case and they were overlooked by the author.

Scypha raphanus (Schmidt, 1862) de Laubenfels, 1936a

The species thus tentatively identified was found growing on the pilings at Friday Harbor.

¹ A posthumous paper, edited by Frank J. Little, Jr., Department of Zoology, University of Texas, Austin, Texas. Manuscript received February 11, 1960.

It is in the form of great pendants tapering at each end, and cylindrical in the central region. Common sizes range from 3×30 mm. to 8×50 mm. The color in life was dirty white but was considerably obscured by accumulations of foreign material on the surface. The consistency is somewhat elastic but in general very fragile. The surface is minutely hispid, minutely cavernous to the naked eye. The critical difference between this genus (frequently known as *Sycon*) and *Grantia* is in the presence or absence of a special dermis, which is present in *Grantia*.

The structure of the chambers is typically sycon, with elongate thimble shaped chambers frequently as large as $180 \times 700\mu$, but in some portions of the surface shallow and cuplike in shape, in this case being about 130μ in diameter and only 100μ in depth. The oscules are about 2 or 3 mm. in diameter and to the naked eye have smooth rims without conspicuous coronal fringes. Microscopical study shows that coronal spicules are present; they are about $6 \times 800\mu$. The spicules of the chamber layer include smaller oxeas about $5 \times 400\mu$ and abundant triaxons with rays $5 \times 75\mu$ to $6 \times 105\mu$. Among them occur a very few tetraxons with cladomes of about the same size as the triaxons, but with rhabds considerably shorter. There are raphide-like spicules perhaps to be classified as microscleres. They are only 0.75μ in diameter and so frequently broken because of their delicacy that maximum lengths cannot satisfactorily be assigned.

Lambe (1893: 38) described a *Sycon* (that is to say, a *Scypha*) with specific name *compactum*, from this vicinity. Its dermal oxeas are very much smaller than those of the specimen here described, and the triacts of the chamber layer have shorter rays of the same thickness, but much more sagittal in shape. It possesses a conspicuous subgastral category of triradiates, and in its gastral quadriradiates the rhabds, instead of being shorter than the clads, are longer. Its shape, moreover, is thicker in proportion to the length than is true to the Friday Harbor sponge.

There are two species of *Sycon*, that is to say *Scypha*, described from California. *S. coronatum* was first placed in the genus *Spongia* by Ellis and Solander (1786: 190). It does not have any

microxeas. *S. coactum* was described by Urban (1905: 55) as of the genus *Sycandra*. It does have microxeas, but does not have typical tufts to the flagellate chambers, that is to say, spicules projecting from the surface, as is true of the Puget Sound sponge. Furthermore, all the spicules of *coactum* are very much larger than those of *raphana*.

S. raphana was first described by Schmidt (1862: 14) from the Adriatic. There are many minute points of difference between it and the American sponge, but at least *pro tem* this identification may be made.

DEMOSPONGIAE

Haliclona permollis (Bowerbank, 1866) de Laubenfels, 1936a

The sponge thus identified was found growing abundantly in a channel at a beach near Argyle on San Juan Island. This was so placed that a strong current rushed past it each time the tide changed. The shape is encrusting with very conspicuous oscular projections. The color in life was a beautiful purple. The consistency is somewhat elastic but rather fragile. The surface, aside from the evident pores, is optically smooth. The oscular projections referred to are about 7 to 9 mm. high, each terminating in a round oscule about 2 mm. in diameter. The total projection, however, is much larger than this, frequently reaching a thickness of 4 or 5 mm. It is very unusual to find such conspicuous oscular tubes on a sponge placed in a strong current, although such are very common in sponges which grow in calm water. The pores are about 100μ in diameter and 200μ or 300μ apart, and as mentioned above, they show very plainly. The internal structure is an isodictyal or "renierid" reticulation of spicules united chiefly at their apices. These are of one sort only, oxeas approximately $7 \times 100\mu$.

This species is clearly conspecific with that which Lambe (1893: 26) recorded from British Columbia and identified as *Reniera cinerea*, a name which unfortunately can no longer be employed, as was shown by de Laubenfels (1936a: 39). A lavender species of *Haliclona* of this general type is found in many places in the world. They are separated from each other only by such

items as minute differences in average length of spicule, and it may well be that they are really conspecific, although this is far from certain. From the majority of them the Puget Sound species differs in having considerably shorter spicules. Those of Europe and California, for example, are 140μ long, instead of only 100μ .

Xestospongia vanilla (de Laubenfels, 1930) 1932

The specimen thus identified was found growing intertidally on Brown Island, July 1, 1931. It is a thinly encrusting specimen, at most 2 or 3 mm. thick, and spreading indefinitely laterally. The color is a pale drab, and the consistency is almost stony hard. The surface is smooth and even except for the minute pores and an occasional oscule well under 1 mm. in diameter. The endosomal structure is very dense, the spicules being crowded close together, but permeated by canals which are arranged so frequently at right angles to each other that their pattern is that of a reticulation. The spicules are of one sort only, hastately pointed oxeas about $11 \times 137\mu$. A few which are much smaller are possibly to be regarded as being not yet fully developed.

This species was originally described by de Laubenfels (1930: 28) as *Haliclona vanilla* and was transferred by him (1932: 116) to the new genus *Xestospongia* with a fairly complete discussion of the species and genus. The Puget Sound specimen is entirely typical, differing in no important respects from the common California species.

Sigmatocia edaphus (de Laubenfels, 1930) 1936a
Fig. 2a

The sponge so identified was collected on July 3, 1931, being dredged from a depth of 15 m. in Peavine Pass. Large masses aggregating several handfuls, amorphous in shape, were taken at this time. The color in life was pale drab, almost white, and the consistency is stony hard. The surface is comparatively smooth; microscopically it is seen to be abundantly provided with pores only a little more than 100μ in diameter. The oscules average about 10 mm. apart and are nearly 1 mm. in diameter. The interior is rather dense, but is somewhat breadlike in structure, without any conspicuous reticulation of canals. They are united in a somewhat iso-

dictyal fashion, that is to say, connected to each other at their apices in such a way as to make triangular or polygonal meshes. Those immediately at the surface placed horizontally make a network of even finer mesh than that of the endosome. The megascleres of this sponge are of one type only, oxeas approximately $22 \times 285\mu$. There is also one type of microsclere present, a sigma varying from 40μ to 66μ in length.

The Puget Sound specimen is in very complete agreement with the specimen described as *Gellius edaphus* by de Laubenfels (1930: 28) and discussed by him in more detail and compared to related species (1932: 111). The species was transferred to *Sigmatocia* by de Laubenfels (1936a: 69).

Lissodendoryx firma (Lambe, 1894) new transfer
Fig. 1, A1, A2, A3

The sponge thus identified was collected on July 3, 1931. It was dredged from a depth of 75 m. near Turn Island.

It is a compactly massive sponge, only 4 or 5 cm. in greatest diameter and in life was a rich orange color. The consistency is firm, somewhat elastic. The surface is slightly tuberculate, but in general might be described as smooth, a very evident special dermal reticulation being fine grained. The pores are minute and the oscules are represented only dubiously by a few openings much less than 1 mm. in diameter which possibly were mere accidental ruptures in the surface. The interior is dense, provided with only a small amount of open space in the form of canals or gross chambers. The special dermal tornotes are hastately pointed tylostrogyles $7 \times 343\mu$. The principal skeleton is made up of a more or less confused dense mass of smooth styles, exceptionally large for this genus. They are $36 \times 440\mu$. The microscleres include arcuate isochelas of one sort, length 43μ , and sigmas of one sort, length 30 to 32μ .

This species was first described as *Myxilla firma* by Lambe (1894: 122). It may appropriately be compared to *Lissodendoryx kyma* de Laubenfels, 1930 (p. 27). This California sponge lacks the sigmas, and all of its spicules are notably smaller than those of *firma*. It should be commented, however, that *kyma* and *firma* are remarkable in the genus for the exceptionally

large size of the spicules; they are doubtless related forms.

Lissodendoryx noxiosa de Laubenfels, 1930

Fig. 1, B1

The specimen thus identified was dredged on July 3, 1931, at a depth of 15 m., in Peavine Pass; masses aggregating several handfuls came up in the dredge.

The shape is amorphous and the color in life a dull yellowish drab. The characteristic unpleasant odor was very much in evidence in life, and seemed to be identical with the odor of the California specimens to the best of the recollection of the author. The consistency is softly spongy, fragile. The surface is irregularly tuberculate, but otherwise is optically smooth because the dermal skeleton is of very fine mesh. Rather numerous oscules are scattered about, averaging somewhat under 1 cm. apart, and 0.5 to 1.5 mm. in diameter.

The endosome is very much like the structure of a crumb of bread, the spicules being arranged primarily in bunches, but otherwise in a somewhat isodictyal reticulation in the masses surrounding the numerous gross chambers. The special dermal spicules may be described in general as being tylotes, but very frequently there is a rounded promulgation at each end, as though they were strongyles with a tylote enlargement near but not at each end. Others of them have one end larger than the other and the smaller end somewhat spined. The variety of shapes is quite remarkable. The endosomal spicules are smooth styles, with here and there what may be interpreted as an incipient spine. Only arcuate chelas 28μ were in evidence as microscleres.

This species was described by de Laubenfels (1930: 27) from California, where it is very abundant, and yet it is doubtful if any California specimen has attained the very large size of the Puget Sound one. Lambe (1894: 121) had a *Lissodendoryx* which he identified as *Myxilla borentsi* Vosmaer, 1885 (p. 27). This was almost certainly the form at present under discussion and not the arctic species of Vosmaer. Lambe's specimen had as its principal spicules styles with small spines on them. Whereas this is not common, it is really the case in the Peavine Pass specimen and various California speci-

mens also show this tendency. Lambe's specimen had sigmas, as do the California specimens. The latter variety has megascleres about thirty percent shorter but not thinner than those of the Puget Sound sponges. Taken by itself alone, this is a trivial difference. The general agreement, and especially the very distinctive odor render it possible to make the identification with *noxiosa* very confidently.

Burtonanchora lacunosa (Lambe, 1892) de Laubenfels, 1936a

The sponge thus identified was dredged on July 3, 1931, in Peavine Pass, at a depth of 15 m. It is a small subovate mass about 2×3 cm. The color in life was fleshy pink, and the consistency is softly spongy to fragile. The surface, otherwise smooth, is rendered irregular by the pore areas and oscules mentioned below. There is definite evidence of the presence of a special dermal layer. The round oscules are nearly 1 mm. in diameter and are scattered here and there more than 1 cm. apart in most places, but occasionally as little as 2 mm. apart. Except within regions about 2 or 3 mm. from the oscules, the entire surface of the sponge is dotted with pore areas each nearly 1 mm. in diameter and about 2 mm. apart, center to center. Each of these circular areas is a sieve with the pores approximately 100μ in diameter, and crowded closely together.

The endosomal structure is between subisodictyal and confused. The special dermal spicules are inequi-ended hastately pointed tornotes, about $7 \times 220\mu$. The endosomal spicules are somewhat spiny styles $12 \times 220\mu$. The microscleres include sigmas 23μ long, and isochelas slightly longer. The latter are here interpreted as being anchorate, but they are far from being typical anchorate chelas, verging strongly towards the arcuate.

Lambe (1892: 70) described a sponge from the vicinity of Vancouver as *Myxilla lacunosa*, which is rather clearly the form under discussion but which has one difference, i. e., that the principal spicules according to Lambe were not spiny. At the same time (p. 71) Lambe records another *Myxilla* which he identifies as being *rosacea* of Lieberkühn (1859: 521). This second specimen has the principal spicules like the Pea-

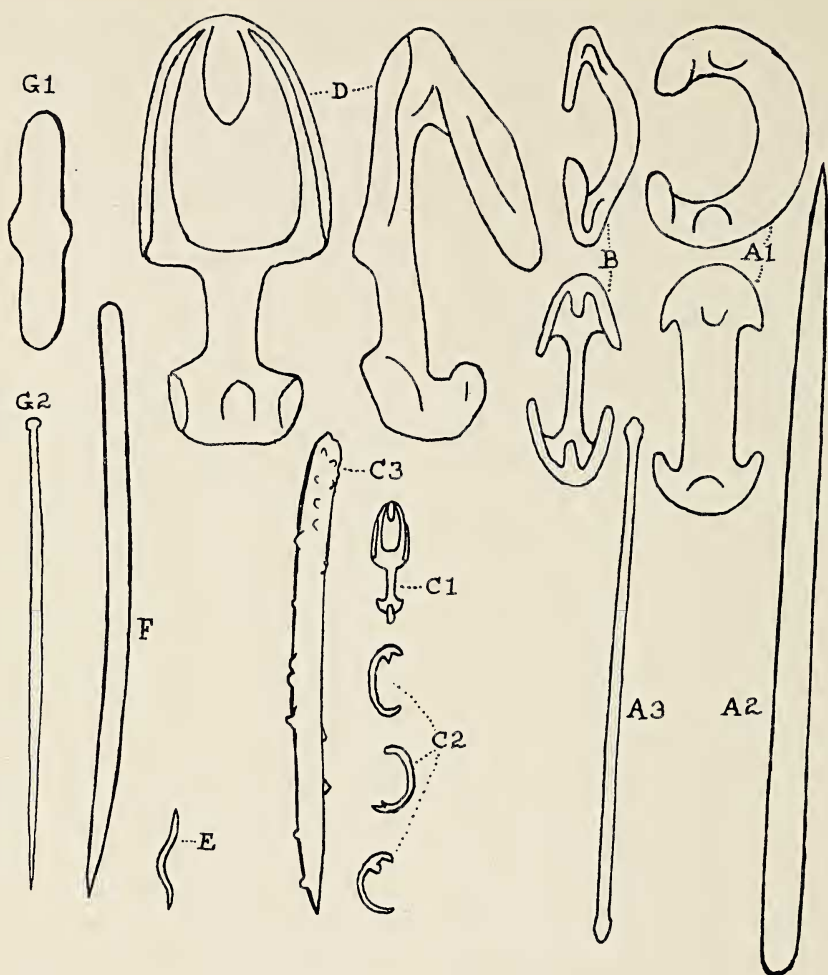


FIG. 1. *A*, *Lissodendoryx firma* (Lambe): 1, chelas, $\times 880$; 2, style, $\times 212$; 3, dermal tornote, $\times 212$. *B*, *Lissodendoryx noxiosa* de Laubenfels; chelas, $\times 880$. *C*, *Iophon chelifera* var. *californiana* de Laubenfels: 1, anisochela, $\times 212$; 2, bipocilli, $\times 212$; 3, acanthostyle, $\times 212$. *D*, *Mycale adhaerens* (Lambe); anisochela, $\times 880$. *E*, *Opblitaspongia pennata* (Lambe); toxa, $\times 212$. *F*, *Stylissa stipitata* new species; style, $\times 212$. *G*, *Choanites suberea* var. *lata* (Lambe): 1, *microstrongyle*, $\times 880$; 2, tylostyle, $\times 212$. (All from camera lucida drawings.)

vine Pass specimen now being discussed. Its isochelas and sigmas were both, however, about double the length of those of his *lacunosa* and those of the Puget Sound sponge. It is very frequently the case in the Myxillinae that there are two categories of chelas, a larger and a smaller, and two categories of sigmas, a larger and a smaller. One or the other of these may be common while the other is rare. It may be that there exists in the vicinity of Puget Sound but a single species, properly to be termed *lacunosa*, hav-

ing a full complement that includes larger and smaller chelas, and larger and smaller sigmas. It may be that in a specimen which Lambe described as *lacunosa* he found only the smaller microscleres, and in the one he identified as *rosacea* he found only the larger. It is here proposed that the specimen identified by Lambe as being *rosacea* should be dropped in synonymy to his *lacunosa*. Neither of these two specimens described by the latter author possesses the peculiar arrangement of the surface found in the

sponge from Peavine Pass, but Lambe (1894: 121) described from the vicinity of Alaska a sponge which he named *Myxilla bebringensis*. The dermal spicules and microscleres are very like those of his *lacunosa*, and significantly the endosomal spicules vary from entirely smooth as in his *lacunosa* to spiny as in the specimen he identified as *rosacea*. This *bebringensis* did have the peculiar arrangement of the pores and oscules of the specimens herein described. It seems probable that only one species is involved in all of these descriptions, and it is therefore proposed that *Myxilla bebringensis* Lambe be dropped in synonymy to his *lacunosa*, which was transferred to the genus *Burtonanchora* by de Laubenfels (1936a: 94).

Ectyodoryx parasitica (Lambe, 1893) de Laubenfels, 1936a

This species is exceedingly abundant in the vicinity of Friday Harbor, occurring apparently always on the shells of bivalve mollusks belonging to the genus *Pecten*. In fact, practically every specimen of *Pecten* collected in this vicinity seems to have been utilized by the sponges. Usually the sponges are of this species, but occasionally *Mycale adhaerens*, to be described below, is also found on the shells. Two hundred and two such sponge-covered pectens were taken for study, and of them 183, or well over 90 per cent, proved to have *Ectyodoryx*. Nineteen had the *Mycale*. It was further noticed that in each case when both the valves of the pelecypod were abundantly covered with sponge, that the mollusk was always a male, though not all males were so distinguished.

The crust has a relatively smooth surface, although showing many openings such as pores and oscules. Thickness may attain to 12 or 15 mm., and lateral extent is of course limited by the size of the shell. The color in life is a dull grayish drab and the consistency is weakly spongy or fragile. The surface is abundantly covered with rather coarse pores and oscules about 1 mm. in diameter, irregularly scattered.

The endosome is "crumb-of-bread" in appearance and consistency. The special dermal spicules are hastately pointed tornotes, verging slightly upon the tylote shape. They are from $4 \times 130\mu$ to $6 \times 145\mu$. The endosomal or princi-

pal spicules are styles, usually acanthose, about 11μ in diameter, but ranging in length from 190 to 270μ . Occasionally the spines are almost or completely wanting, which is very interesting in comparison to the preceding species, as is also the fact that there are two categories of isochelas present. These are anchorate, the larger being 54μ in length, while the smaller are only 14μ in length. There are also two sizes or categories of sigmas, each respectively about the size of the corresponding isochelas.

This species was originally described by Lambe (1893: 31) from Vancouver Island, as *Myxilla parasitica*. It was reviewed by de Laubenfels (1936a: 84) and its correct location in the genus *Ectyodoryx* was shown by him.

Tedania fragilis Lambe, 1894

The specimen thus identified was dredged northeast of Blakeley at a depth of between 50 and 66 m., on July 6, 1931. It is an encrustation less than 1 cm. thick, and about 2×4 cm. in area. In life it was flesh colored, and the consistency is very soft, fragile and compressible. The surface is comparatively smooth, almost glabrous. Pores and oscules can not be made out.

The endosome is rather dense to the unaided eye and microscopically is seen to be packed with plumose tracts, which is an axinellid characteristic usually not so pronounced in the genus *Tedania*. The special dermal tornotes are hastately pointed, $4 \times 200\mu$. As may be expected the principal skeleton consists of styles, $3 \times 150\mu$ to $7 \times 400\mu$, but it is most astonishing to note that some of these are more or less covered with small spines. The microscleres are onychaetes as is absolutely typical for the genus *Tedania*; these are long thin raphides $1 \times 150\mu$ to $3 \times 200\mu$ which are covered by characteristic roughenings, rather than pronounced spines.

A specimen which must surely have been conspecific with the one under discussion was described as *Tedania fragilis* by Lambe (1894: 116). It was a more typical *Tedania*, not possessing the unusual shape of the styles. Identification of the Puget Sound sponge with *Tedania* is rather confidently made, however, because of the very characteristic microscleres.

Iophon chelifera californiana de Laubenfels, 1932
Fig. 1, C1, C2, C3

The sponge so identified was dredged northeast of Blakeley on July 6, 1931, at a depth of between 50 and 66 m. It is an amorphous mass about $2 \times 3 \times 5$ cm. In life it was a dull drab color, gradually turning black in alcohol. This is characteristic of the genus *Iophon*, and is exhibited by few, if any, other genera in quite the same way, i. e., some turn black suddenly upon exposure to air, etc. The consistency is softly fragile, crumbling. The surface is irregularly tuberculate, with a smooth dermal membrane much in evidence. This is broken off in many places, leaving numerous internal cavities exposed. It is difficult to say whether any oscules show or not; there are what appear to be oscules, but these may be merely places where the dermal membrane has been broken off, exposing the underlying cavities.

The interior is "crumb-of-bread" with an isodictyal reticulation of masses of spicules placed around minute cavities. The special dermal spicules are tyloles 4 to 7μ in diameter and 280μ long. The principal spicules are acanthostyles, reaching a maximum size of $16 \times 320\mu$. The microscleres include palmate isochelas of the peculiar shape characteristic of the genus, and also bipocilli 13μ long, which resemble tridentate unguiferate anisochelas.

Ridley and Dendy (1886: 349) described *Iophon chelifera* and Lambe (1893: 30) recorded a sponge from the vicinity of Vancouver as of this species. There are differences from the typical race which were pointed out by de Laubenfels (1932: 82) in connection with specimens which he had from California, for which he established the subspecies *californiana*. The Puget Sound specimens correspond very closely with those from California, and one need have little hesitation in regarding them as of the same variety. It is very probable that the specimens described by de Laubenfels (1928: 361), as *Burtonella melanokhemia* are also conspecific with this variety of *chelifera*.

Ophlitaspongia pennata (Lambe, 1894) de Laubenfels, 1927
Fig 1, E1

This species was found growing on Brown

Island, just across from the laboratory of the University of Washington. It is an exceedingly thin crust as found at Puget Sound, only 1 or 2 mm. thick, and spreading indefinitely laterally. The color at the time of collection was dull brown. The consistency is somewhat compressible, rather like that of soft wood. The surface is irregular with notable grooves radiating around minute oscules, only 200μ or 300μ in diameter.

The structure consists of innumerable little plumose columns extending up perpendicularly from the base and little if any connected to each other except by protoplasmic structures. The bulk of the spicules in these tracts are stylostyles 16 to 20μ in diameter and about 330μ long. Near the surface many are found which are only $3 \times 200\mu$; these may or may not constitute a separate category. Toxas about 40μ long are occasionally found among the smaller spicules near the surface.

This species was described as *Desmacella pennata* by Lambe (1894: 129). It is an exceedingly abundant sponge along the Pacific Coast of the United States, extending far down in California, almost to the Mexican boundary. It is noteworthy for its ability to survive intertidal conditions, often growing nearer the high tide mark than is true of other species of sponge. The species was transferred to the genus *Ophlitaspongia* by de Laubenfels (1927: 265). For a further discussion of the species, reference may be made to his paper on the sponges of California (1932: 103).

Mycale adhaerens (Lambe, 1893) de Laubenfels, 1936a

Fig. 1, D1, 2 B

This species occurs abundantly in the vicinity of Friday Harbor upon bivalve mollusks of the genus *Pecten*. As noted above in connection with *Ectyodoryx parasitica*, about 10 percent (or slightly less) of the *Pectens* in this vicinity have *Mycale* as the sponge which covers the shell.

The color in life is a dull grayish drab, and the consistency is softly spongy to fragile. The surface is nearly smooth, and what openings are found are susceptible to interpretation as being accidental ruptures in the dermis rather than structural oscules.



FIG. 2. A, *Sigmadocia edaphus* de Laubenfels. B, *Mycale adhaerens* (Lambe). C, *Stylissa stipitata* new species. E, *Choanites suberea* var. *lata* (Lambe).

The structure of the interior is very fibrous, the fibers themselves being plumose as seen under the microscope. They probably contain a small amount of spongin, but are composed chiefly of abundant rows of spicules, which are smooth styles, reaching a maximum size of about $10 \times 320\mu$. However many are as small as $8 \times 300\mu$ and the smaller spicules occasionally show a tendency to be tylostylote. There are very numerous stout palmate anisochelas of three size ranges, 14 to 15μ , 27 to 28μ and 56 to 60μ . This largest category frequently has the spicules associated together in symmetrical groupings known as rosettes. There are also two size ranges of sigmas, the smaller having a chord length of about 20μ , and the larger of 35μ .

This sponge may be readily distinguished in the field from the other *Pecten*-covering sponge, *Ectyodoryx parasitica*, by the very fibrous structure of the interior of the *Mycale*, and the greater ease with which its ectosome may be detached from the endosome.

This species was originally described as *Esperella adhaerens* by Lambe (1893: 27) and the genus was later shown to be synonymous with *Mycale* by de Laubenfels (1936a: 122).

Stylissa stipitata new species

Fig. 1, F1, 2 C

The holotype, USNM no. 22687, was collected near False Bay of San Juan Island. It was dredged at a depth of 20 m., only 100 m. off

shore. Other specimens were taken later in the same month, July, 1931, at a depth of 45 m. at Griffin Bay.

This species is typically funnel-shaped with an elongate stem. The maximum diameter of the cone is at the distal end and at that place is 20 mm. across. The thickness of the wall is only 2 or 3 mm., and at the thinnest the stem is also only 2 or 3 mm. in diameter. The total length, or height, of the sponge is approximately 10 cm., of which 5 or 6 cm. may be described as stem, the remainder being the hollow funnel, shaped like an inverted cone.

The color in life was light drab. The consistency is spongy, very flexible, tough, and not easily torn.

The surface is moderately smooth to the naked eye, especially on the exterior of the sponge, where there is an obvious ectosomal specialization of very fine meshed reticulation. This is frequently cracked, but other than this, no oscules are evident. It is probable that the efferent openings are the abundant minute ones on the interior of the hollow funnel.

The spicules on the interior are arranged in a rather confused manner, but in general with the points towards the surface. The adjective "plumose" might be applied to the appearance in many places. There can be little doubt that this is axinellid structure. The megascleres show typical axinellid variation in size. Only smooth styles have been found; these are $2 \times 180\mu$ to $4 \times 366\mu$.

The genus *Stylissa* was established by Hallman (1914: 349) to have as genotype the sponge described as *Stylotella flabelliformis* by Hentschel (1912: 355). This East Indian species is very much like the Puget Sound one here described, except that its spicules are somewhat larger, and it is cup-shaped without any stem. Another similar shape is that for which Gray (1867: 513) established the genus *Tragosia*, a species originally described as *Spongia infundibuliformis* by Linné (1858: 1348). It is very like the one under consideration except that it is shorter of stem and is usually broader and more cup-shaped. It is tremendously more hispid as to the surface, and its spicules include oxeas as well as styles. It is typically an European species.

Syringella amphispicula new species

Fig. 2 D

The holotype, USNM no. 22707, was dredged July 24, 1931 at a depth of 45 m. in Griffin Bay. It is a ramose sponge, with a very few anastomoses between the gnarled and misshapen branches. The latter are 3 to 10 mm. thick and about 6 cm. high, with obtuse, club-shaped ends. The color in life was ochre yellow, the consistency very tough and flexible. The surface is even but undulating, nearly lipostomous.

There is a dense axial specialization of longitudinally arranged megascleres, among which spongin may have been present, but not conspicuous. This axis often has a diameter slightly more than half that of the entire branch. In the flesh around this axial core the spicules are arranged perpendicular to the surface and at right angles to the axis. The spicules are exclusively tylostyles, many about $18 \times 670\mu$, but also much smaller. Numerous very small ones (say $2 \times 100\mu$) may be immature forms, or may constitute a separate category, but are connected to the larger type by numerous intermediates. The different sizes are mixed among each other, not localized.

This new species is unique in the genus *Syringella* for its abundance of the smaller spicules, that in it nearly make up a second size range. Many (but by no means all) of the species of this genus have a central hollow to the branches. Many have more spongin than does *amphispicula*.

Cliona celata Grant, 1826

The sponge thus identified was dredged from a depth of about 5 or 10 m. on July 3, 1931, south of Turn Island. It was found growing in a mass of broken barnacle shells, making sub-circular tunnels 0.5–1.5 mm. in diameter. From them minute papilles protrude here and there a distance of about 1 mm. in life. The color in life was lemon yellow. The consistency is soft and the spicules are arranged in a rather confused fashion within the tunnels. The spicules are of one sort only; tylostyles about $10 \times 285\mu$.

This sponge was originally described by Grant (1826: 79) from Europe, but it is a well-

known cosmopolitan sponge. Its wide distribution may be due to the fact that it bores in the shells of mollusks which may transport it freely from place to place. It frequently disintegrates the shells completely in the course of time, and may do serious damage to commercial oyster beds. As an older sponge it grows up and out from its earlier boring habitat to make large yellow masses, frequently the size of a man's head. Such were not found in Puget Sound, however; only a few small boring specimens being recorded.

Choanites suberea var. *lata* (Lambe, 1892) de Laubenfels, 1936a

Fig. 1, G1-2, 2 E

The sponge thus identified is moderately common in the vicinity of Friday Harbor, frequently occurring on hermit crab shells, which may in the course of time be completely replaced by the sponge so that no trace of the calcareous material remains, except that the sponge preserved the shell-shape as a mold might.

The total mass is frequently more than 3 cm. in diameter. The color in life was gray white and the consistency was stiff, cartilaginous or cork-like. The surface is optically very smooth; pores are not in evidence, but a few oscules 2 to 4 mm. in diameter are found, usually from only one to three per sponge.

Within the sponge the spicules are densely packed, although there are distinctive gross canals 0.5 to 1.5 mm. in diameter. An even denser ectosomal region which might almost be described as a cortex extends from 0.3 to 0.7 mm. below the surface. In it practically all the spicules are placed with their points toward the surface, whereas this is frequently but not always the case in the interior of the sponge. These ectosomal spicules are perhaps slightly smaller than those of the endosome. The megascleres of this species are of one sort only, tylostyles 5×280 to $6 \times 180\mu$. The microscleres are centrotylote microstrongyles 24 μ long.

This species was described from European specimens as *Spongia suberea* by Montagu (1818: 100). The Puget Sound species in ques-

tion was first described by Lambe (1892: 71) as *Suberites latus*. This was recorded from California by de Laubenfels (1932: 52) where it is reduced to a subspecies of *Ficulina suberea*. The genus *Ficulina* being a complete synonym of *Choanites*, however (de Laubenfels 1936a: 144), the genus must be designated according to the prior appellation. The principal or European variety has slightly smaller spicules, and is frequently, though not always, rosy red in color.

REFERENCES

- ELLIS, J. 1786. The Natural History of Many Curious and Uncommon Zoophytes Collected from the Various Parts of the Globe. Systematically Arranged and Described by the Late Daniel Solander. London. 206 pp., 63 pl.
- GRANT, R. E. 1826. Notice of a new zoophyte (*Cliona celata* Gr.) from the Firth of Forth. Edinb. New Phil. J. 1: 78-81.
- GRAY, J. E. 1867. Notes on the arrangement of sponges with the description of some new genera. Proc. Zool. Soc. Lond.: 492-558, pl. 27-28.
- HALLMAN, E. F. 1914. A revision of monaxid species described as new in Lendenfeld's "Catalogue of the Sponges in the Australian Museum." Proc. Linn. Soc. N.S.W. 39: part I, 263-315, pl. 15-24; part II, 327-376; part III, 398-446.
- HENTSCHEL, E. 1912. Kiesel- und Hornschwämme der Aru- und Kei-Inseln. Abh. Senckenb. Ges. 34: 295-448, pl. 13-21.
- KIRK, H. B. 1894. Contribution to a knowledge of the New Zealand Sponges. By.... In: Trans. N. Z. Inst. 26: 175-179, pl. 22.
- LAMBE, L. M. 1892. On some sponges from the Pacific Coast of Canada and Behring Sea. Proc. Trans. Roy. Soc. Can. 10, sec. 4: 67-68, pl. 3-6.
- 1893. Sponges from the Pacific Coast of Canada. Proc. Trans. Roy. Soc. Can. 11, sec. 4: 25-43, pl. 2-4.
- 1894. Sponges from the western coast of North America. Proc. Trans. Roy. Soc. Can. 12, sec. 4: 113-138, pl. 2-4.

- LAUBENFELS, M. W., DE. 1927. The red sponges of Monterey Peninsula, California. *Ann. Mag. Nat. Hist.* ser. 9, 19: 258-266.
- 1928. A new genus and species of sponge from Puget Sound. *Publ. Puget Sd. Biol. Sta.* 5: 361-363.
- 1930. The sponges of California. *Stanf. Univ. Bull.* ser. 5, 5(98): 24-29.
- 1932. The marine and freshwater sponges of California. *Proc. U. S. Nat. Mus.* No. 2927, 81: 1-140.
- 1936*a*. A discussion of the sponge fauna of the Dry Tortugas in particular and the West Indies in general, with material for a revision of the families and orders of the Porifera. *Carneg. Instn. Publ.* 467: 1-225.
- 1936*b*. A comparison of the shallow water sponges near the Pacific end of the Panama Canal with those at the Caribbean end. *Proc. U. S. Nat. Mus.* No. 2993, 83: 441-466.
- LINNÉ, C. VON. 1758. *Systema Naturae*. Tom. I: Animalia. Editio decima, reformata. Holmiae.
- MONTAGU, G. 1818. An essay on sponges, with descriptions of all the species that have been discovered on the coast of Great Britain. *Mem. Werner Soc.* 2: 67-122, pl. 3-16.
- RIDLEY, S. O., and A. DENDY. 1886. Preliminary report on the Monaxonida collected by H.M.S. Challenger, Parts I, II. *Ann. Mag. Nat. Hist.* ser. 5, 18: 325-351, 470-493.
- SCHMIDT, O. 1862. *Die Spongien des Adriatischen Meeres*. Leipzig. vii + 88 pp., 7 pl.
- URBAN, F. 1905. Kalifornische Kalkschwämme ... Von In: *Arch. Naturgesch.* 72: 33-76, pl. 6-9.
- VOSMAER, G. C. J. 1885. The sponges of the Willem Barents Expedition 1880 and 1881. *Bijdr. Dierk.* 12: 1-47, pl. 1-5.